A DA-converter system and a method for converting a multi-bit digital signal to an analog signal

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The invention relates to a DA-converter system comprising a digital sigma-delta modulator for receiving a multi-bit digital input signal, for providing a reduced word-length digital output signal and for noise shaping the quantization noise generated thereby to a frequency band outside the frequency band of the digital input signal, said DA-converter system further comprising a digital to analog converting combiner with first and second digital inputs and an analog output and with the first digital input connected to the output of the digital sigma-delta modulator. Such DA-converter system is e.g. known from US patent 5,724,038.

A usual system for converting a multi-bit digital signal to its analog equivalent is to firstly convert the low rate multi-bit digital input signal to a high rate single-bit digital signal by means of a sigma-delta modulator and to subsequently DA-convert the high rate single bit signal. The DA-converter can then for instance be a single switched current source, which is simple in construction and is free of non-linear distortion, because each bit is converted by the same current source. A drawback of such system is the large amount of quantization noise. The majority of the quantization noise is shaped to the higher frequencies outside the frequency band of the signal to be converted but can still cause distortions in many applications. A smaller part of the quantization noise resides in the lower frequency band of the converted signal and deteriorates the S/N-ratio of the converted signal. For these reasons it is nowadays preferred to use a sigma-delta modulator with a word-length m that is substantially smaller than the word-length of the input signal but that is larger than 1 bit. Such reduced but still multi-bit word-length will hereafter be referred to as a "few-bit" word-length. Present day DA-converter systems may e.g. use a few-bit word-length m of 5 bits. An m-bit quantizer reduces the quantization noise by approximately 6(m-1) dB. The output signal of the sigma-delta modulator then has to be converted by a DA-converter with more current sources, but present few-bit DA-converters are very well suitable to operate with excellent linearity among others by using modern dynamic element matching techniques. Therefore this few-bit word-length provides good S/N ratios in the low frequency band and